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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/040,395 | 01/07/2002 | Cheisan J. Yue | P01,0365 | 2072 |

128 7590 10/06/2003

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| EXAMINER |
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HU, SHOUXIANG

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| ART UNIT | PAPER NUMBER |
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2811

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/040,395

Applicant(s)

YUE ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Claim 1-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, with claims 1 and 21 being identified as the linking claims. Election was made **without** traverse in Paper No. 4.
2. In addition, claim 30 is also withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being unreadable on the elected invention. The elected Group-II invention is directed to a method, while claim 30 is directed to a device that is readable on the non-elected Group-I invention.
3. Accordingly, claims 1-30 are pending in this application; and claims 21-29 remain active in this Office action.

Claim Objections

4. Claims 21-29 are objected to because of the following informalities and/or defects:

In claim 21, the term of "each P- well" should read as: --each of said P- wells--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 21, 22, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Litwin et al. ("Litwin"; US 6,100,770).

Litwin discloses method (see Figs. 1-2 and 10-13, also see col. 6, lines 10-17, and col. 8, line 52, through col. 9, line 42), comprising: forming a plurality of alternating first conductivity-type wells (the first conductivity-type doped regions between the second conductivity type regions 91 in the big well region 82) and heavily doped second conductivity type regions (91; P+) in a bulk silicon layer (81) such that each of the first conductivity type wells forms a first PN junction with the heavily doped second conductivity type region on one side and a second PN junction with the heavily doped second conductivity type region on the other side; forming a plurality of gate oxides (within a big oxide layer), wherein each of the gate oxides is formed above a corresponding one of the first conductivity type wells; forming a plurality of polysilicon gates, wherein each of the silicon gates is formed above a corresponding one of the gate oxides; electrically coupling each of the polysilicon gates together; and, electrically coupling each of the heavily doped second conductivity type region regions together.

Although Litwin does not expressly disclose that the first and second conductivity types can also be P and N types, respectively, in the specific embodiment of Figs. 10-13, one ordinary skill in the art would readily recognize that a p-channel MOSFET-type varactor can be desirably and readily formed by simply reversing the doping polarity of the n-channel MOSFET-type varactor, as further evidenced in Litwin. As shown in Figs.

1 and 2 in Litwin, the p-channel MOSFET-type varactor shown in Fig. 2 can be desirably and readily formed by simply reversing the doping polarity of the body region (12) and the source/drain region (13 and 14) of the n-channel MOSFET-type varactor shown in Fig. 1.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the making of the n-channel MOSFET-type varactor into the method of making of the varactor of Litwin, as further taught in Litwin, so that a method for making a varactor with a desired channel type would be obtained.

Regarding claim 28, Litwin further teaches that each of the silicon gates can have a width-to-length ratio in a range covering a ratio of approximately 16 to 1 (see col.6, lines 10-17).

7. Claims 23, 24, 26, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Litwin et al. ("Litwin"; US 6,100,770) in view of Chiang et al. ("Chiang"; US 5,038,184) and/or tang (US 5,563,438).

The disclosure of Litwin is discussed as applied to claims 21, 22, 25 and 28 above.

Although Litwin does not expressly disclose that the channel forming silicon layer can be formed overlying an insulation layer, Chiang teaches that such a silicon-on-insulator-type substrate can be desirably used to form fully depleted channel regions so as to increase the capacitive switching ratio of the varactor (see Figs. 2-3 and 7; also see col. 4, lines 26-36, col. 5, lines 14-16, and col. 7, lines 32-35), which naturally

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includes a floating body region between the source/channel junction and the drain/channel junction both extending from the top to the bottom of semiconductor layer (42). And, one of ordinary skill in the art at the time the invention was made would readily recognize that silicon-insulator substrates of both the silicon-on-oxide type (SOI type, which normally naturally includes a highly resistive silicon bottom layer) and the silicon-on-sapphire type (SOS) had become readily available for either N-channel or P-channel type MOS devices, as evidenced in Tsang (see col. 3, lines 36-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the silicon-on-insulator varactor structure of Chiang into the method of making of the varactor of Litwin with the substrate being either an SOI type or an SOS type, as taught in Tsang, so that a method for making a varactor with increased capacitive switching ratio would be obtained.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703) 306-5729. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH
September 19, 2003

A handwritten signature in cursive script, appearing to read "Shouxiang Hu".

SHOUXIANG HU
PRIMARY EXAMINER